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THE QUALITY OF AIR FORCE OUTPATIENT CARE: HOW WELL DO PHYSICIAN--ETC(U)

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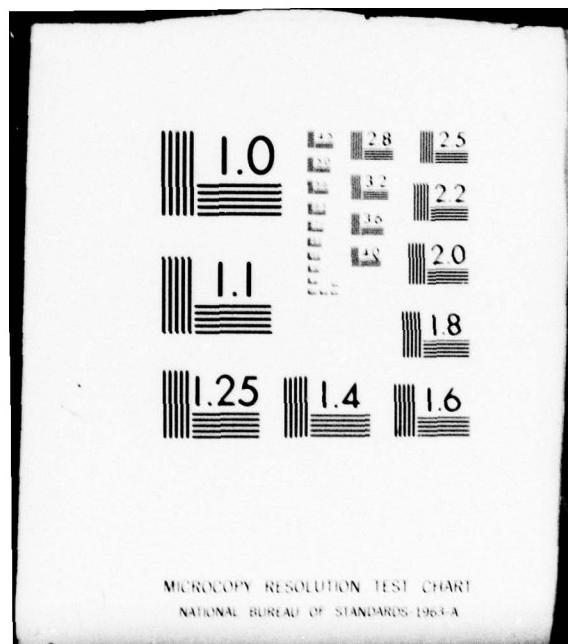
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This Note analyzes quality of care rendered by physician assistants, who work under a doctor's general supervision in Air Force clinics and care for some patients formerly treated by physicians. It focuses on the technical process of care, and uses data collected with a patient contact record at nine Air Force bases in 1974. For a set of conditions that account for 20 to 25 percent of outpatient visits to clinics dealing with general medicine problems, the analysis shows that physician assistants are performing at least as well as physicians. It is concluded that the Air Force can deliver the same quality of medical care when physician assistants, working under a doctor's general supervision, treat some of the patients formerly seen by physicians.



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June 1979

THE QUALITY OF AIR FORCE OUTPATIENT CARE: HOW WELL DO PHYSICIAN
ASSISTANTS PERFORM?

George A. Goldberg, Andrew F. Siegel, David S. C. Chu, David G. Jolly

A Rand Note
prepared for the
United States Air Force



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PREFACE

This Note reports on work conducted at Rand on "Air Force Health Delivery Systems." The research, done under Project AIR FORCE, represents one facet of an analysis of the role that physician assistants might play in Air Force outpatient clinics--the quality of care they deliver.

This Note presents an analysis of data collected in 1974, analyzed in 1976, and reported to the Air Force in 1977. It provides background for understanding the analysis of a more extensive data collection effort carried out in 1977. A more recent and detailed report, dealing in greater depth with the same issue, is forthcoming under the title "Physician's Extenders in Air Force Primary Medicine Clinics: Quality of Care."

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SUMMARY

With the ending of the physician draft and the subsequent decrease in physician manning, the Air Force has considered alternative staffing patterns in which physician assistants, working under a doctor's general supervision, take care of some patients formerly treated by physicians. This Note analyzes the quality of care rendered by these physician assistants, using as a standard of comparison the care rendered by physicians in the same settings. It focuses on the technical process of care and uses data collected with a patient contact record at nine Air Force bases in 1974.

Looking at a set of conditions that account for 20 to 25 percent of outpatient visits to clinics dealing with general medicine problems, we find that physician assistants are performing at least as well as physicians. We conclude that the Air Force can deliver the same quality of medical care when physician assistants, working under a doctor's general supervision, treat some of the patients formerly seen by physicians. The performance of these physician assistants constitutes a strong endorsement of the Air Force's in-house physician assistant training program. The proven quality of this program should be weighed in any decision concerning future sources of Air Force physician assistants.

ACKNOWLEDGMENT

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I. INTRODUCTION

The end of the physician draft has meant a substantial decrease in the number of physicians available to the Air Force for the provision of inpatient and ambulatory (outpatient) care. The Air Force has therefore considered alternative staffing patterns which permit the available physician force to continue providing needed medical care. These include staffing arrangements in which highly trained physician extenders (like the physician assistant*) work in combination with physicians.

Medical care, if delivered successfully, should fulfill four primary constraints: 1) it should be cost-efficient (the economic constraint); 2) it should be administratively feasible (the organizational constraint); 3) it should achieve acceptance by patients using the system (the social constraint); and 4) it should provide care of acceptable quality (the medical constraint). This Note addresses how the fourth constraint is affected by the introduction of highly trained physician extenders like the physician assistant. It considers the policy issue: Can the Air Force deliver the same quality of medical care when physician assistants, working under the general supervision of a physician, treat some of the outpatients formerly treated by physicians? In other words, can a physician assistant provide a portion of the care formerly provided by physicians, without a sacrifice in the level of quality? While primary care nurse practitioners are also due consideration, they are not included in this analysis because data were not available. The emphasis in the Note is on outpatient care because this is the area for which physician assistants have generally been trained.

* The Air Force physician assistant is a former corpsman who has graduated from a two-year program of instruction that includes one year of classroom work in the basic sciences, and a one-year rotation through the outpatient departments of a large Air Force hospital. The physician assistant is therefore trained to diagnose and treat common illnesses, and can also help manage complex patient problems under the supervision of a physician.

II. METHOD AND RESULTS

In approaching the research question of the quality of care rendered by physician assistants, we used a comparative method. We compared the physician assistants' quality of care with physicians' quality of care, for conditions that physician assistants (as well as physicians) are trained to treat. The comparative approach allows us to examine how well the physician assistant measures up. It permits us to approach the question of whether or not physician assistants' care is at least as good as care provided by physicians, at least for the type of routine outpatient problems that physician assistants are trained to treat.

Specifically, we compared physician assistants and physicians in two ways: 1) the provision of appropriate quality of care, as measured in terms of "technical process" of care, and 2) the degree of misordering or overutilization of tests or procedures, in which a pattern of ordering, suggestive of wasteful or unnecessary testing, was sought.

The data source for this Note was Rand's 1974 survey of outpatient care. The survey used the Patient Contact Record (PCR), an "encounter form". (See Appendix A for a copy of the PCR.) The PCR is a check-off list filled out partly by the patient (or parent), and partly by the provider(s) of care. At the time of the visit, the patient filled out requested demographic information, while the provider of care checked off diagnostic and therapeutic information.

The data presented come from nine Air Force base hospital clinics, which were surveyed by use of the PCR. At two of the bases, a PCR was filled out for each patient during a six-month period, while at the remaining seven bases, a PCR was filled out for each patient during a two-week period. The descriptive data thus gathered came from all of the outpatient clinics at each base, rather than from selected clinics. Our analysis pools the data collected at the nine bases. This was possible because our analysis of results from each base showed no significant variation from base to base, for the questions addressed in this Note. It is reasonable to pool the data from all bases, so long as there is no major variation from base to base.

THE DATA COLLECTION INSTRUMENT

The Patient Contact Record is a data collection instrument known generically as an "encounter form". Like any other data collection instrument, the encounter form has both strengths and limitations. The greatest advantage of the encounter form is that it is completed at the actual moment of provision of care; furthermore, the crucial information is furnished by the actual provider of care. In view of the fact that the PCR was filled out for a limited time period, we are reasonably certain that the providers of care were highly motivated to record accurately the actual care delivered.

There are also limitations to an encounter form. One of them is that the provider is limited to those diagnostic, procedural and therapeutic categories which are available for check off. In addition, it is possible to make recording errors or to omit an item. Although one can always point to the unverifiable accuracy of diagnosis, that particular limitation pertains to virtually all methods currently in use for gathering data relevant to the quality of medical care, and is not a special liability of the encounter form. Finally, the 1974 Rand PCR had not been designed with the specific intention of measuring quality of medical care.

When all the strengths and limitations are considered, the PCR was felt to be a very good means of gathering data from outpatient areas. The strength of having the PCR completed by the provider at the actual time of visit cannot, in our opinion, be overestimated. In addition, it is possible that some of the limitations of the PCR were really a blessing in disguise. Because of the limited selection of categories available for check off, it was mandatory on our part to concentrate on straightforward, stark, simple criteria for measuring the technical process of care. Thus, as will be seen, there is less room for cavil over the selected criteria.

The PCR also compelled us to concentrate on measuring the technical process of care. Quality of medical care has traditionally been organized into three areas: structure (available facilities, equipment, and personnel), process (what is done to or for the patient), and outcome (what happens to that patient). Quality of

medical care may also be divided into "technical" quality and "art of care" quality. "Technical process" quality is relatively easy to measure, but is always open to the question of the connection of the process of care with the eventual outcome of care. By concentrating on ordinary conditions of low or moderate complexity (which comprise the majority of cases seen in Air Force outpatient clinics), we believe we avoided the potential difficulties in concentrating on measuring "technical process" quality of care. The diagnostic and therapeutic actions which comprised our criteria for various conditions quite obviously bear a relationship to the outcome of care.

FORMAT OF RESULTS

Table 1 is labeled First Visit Technical Quality. First, let us review its format. The far left column lists a number of conditions which were seen in outpatient clinics. The diagnoses are common, everyday problems--they are routine outpatient fare. It should be noted that the conditions discussed in this Note, although few in number, represent between 20 and 25 percent of all visits made to general medicine outpatient areas. The simplicity of diagnoses also guards against the potential problem of misdiagnosis, a difficulty which would clearly invalidate the application of quality criteria. These diagnoses are ordinary enough so that room for misdiagnosis is much reduced from what it would be if complex outpatient or inpatient diagnoses were being considered.

The second column, labeled Good Care Criterion, lists the criteria which were applied to the corresponding conditions in the first column. With the exception of warts, all the criteria listed in this table concerned the first visit for the designated condition. It is important to stress that we present all of the criteria that we could define, for which there was a sufficient number of observations available when data were pooled from the nine bases. Note that the first four criteria represent therapeutic procedures--that is, a therapy that was employed for the condition. The remaining seven criteria deal with diagnostic procedures--that is, certain procedures that should have been carried out because they are needed to make a

diagnosis or to reach a decision regarding management of the patient's condition.

The next two columns, labeled MD Compliance and PA Compliance, present the data for the number of times the physician (MD) and the physician assistant (PA) carried out the good care criterion specified. The MD Compliance column presents cases seen by physicians only, and the PA Compliance column presents patients seen by physician assistants only--that is, patients seen together by a physician and physician assistant are excluded, and patients seen neither by a physician nor physician assistant are also excluded. Finally, the right-hand column reports the presence or absence of statistical significance at the $P \leq 0.05$ level.

Table 1
FIRST VISIT TECHNICAL QUALITY

Condition	Good Care Criterion ^a	MD Compliance	PA Compliance	Statistical Significance?
Impetigo	Prescription	86% n=51	100% n=26	Yes--PA
Otitis media	Prescription	80% n=430	91% n=180	Yes--PA
Acute sinusitis	Prescription	78% n=113	93% n=55	Yes--PA
Urinary tract infection	Prescription	66% n=194	77% n=77	N.S.
Pharyngitis (only)	Throat culture	52% n=155	70% n=155	Yes--PA
Pneumonia	Chest x-ray	52% n=56	67% n=12	N.S.
Urinary tract infection	U/A or culture	61% n=191	79% n=77	Yes--PA
Urinalysis group	Urinalysis	41% n=400	52% n=164	Yes--PA
Diabetes	Blood sugar	42% n=43	29% n=7	N.S.
No diagnosis at this time	CBC ^b	21% n=457	23% n=270	N.S.
Warts	No more than 2 visits	86% n=142 pts.	85% n=53 pts.	N.S.

^aAll criteria (except warts) concern the first visit for this condition.

^bComplete blood count.

TECHNICAL QUALITY OF CARE: RESULTS

Glancing first at the statistical significance column, we note a clear pattern. Physician assistants are performing at least as well as physicians, at least when quality is measured by the criteria we have available, for the kinds of routine, outpatient problems which they are trained to treat.

Let us examine the conditions one by one. The first criterion states: if the patient had impetigo, then a prescription should have been written on the first visit (unfortunately, the PCR was not specific enough for us to know what kind of prescription was written; therefore, we have to be satisfied with information on whether or not there was at least some prescription written). For 86 percent of impetigo patients seen by physicians, the physician wrote a prescription, and for 100 percent of impetigo patients seen by physician assistants, the physician assistants wrote a prescription. The difference is statistically significant.

For otitis media (inflammation of the middle ear, a common problem in children), a prescription should have been written during the first visit when the condition was checked off by the provider. Looking at large numbers of patients (430 seen by physicians and 180 seen by physician assistants), we note that, in most cases, a prescription was indeed written by physicians and by physician assistants. However, physician assistants wrote a prescription significantly more often than physicians. What should we make of the fact that neither the 80 percent nor 91 percent is 100 percent? Shouldn't 100 percent of patients with otitis media have a prescription written on the first visit? It would likely be the consensus of a group of experts that this is so. However, there are good reasons why we should not expect a 100 percent performance. For one thing, it is perfectly possible that the provider occasionally forgot to check a box, or checked the wrong box on the PCR. Secondly, it is perfectly possible that the provider was about to write a prescription when the parent said, "Oh, don't bother to write a prescription, we have ~~some~~ of that medicine left at home from the last time." For these and other reasons, it is always unrealistic to expect 100 percent compliance with any

criterion. Both the 80 percent and 91 percent levels are very high, and suggest that prescriptions were being written for otitis media in virtually all cases by both groups of providers. Note that the PCR grouped serous otitis media and purulent otitis media into one category. Although the type of medicine prescribed may sometimes be different for these two conditions, both conditions do require the prescribing of a medicine, so our criterion is a valid one.

If a patient has acute sinusitis and is being seen for the first time for this condition, a prescription should be written. This was done very often by both groups, and significantly more often by physician assistants.

It is generally accepted that if the diagnosis of urinary tract infection is made, some medicine should be prescribed at the time of initial presentation with the infection. In fact, a prescription was written for urinary tract infection quite often by both groups, with no statistically significant difference.

Now we turn to diagnostic procedures. If the provider is to make a diagnosis of pharyngitis (sore throat), and sore throat is the only problem checked off by the provider (that is, runny nose, fever, or cough was not checked in addition), then a throat culture should be obtained to make certain that the throat has not been colonized with streptococcus, a bacterium for which treatment with an antibiotic is essential. Both physicians and physician assistants saw large numbers of patients with pharyngitis alone (the fact that the number of patients was identical for the two groups is coincidental). Physician assistants outperformed physicians in obtaining throat cultures. Again, we might ask: Are the 52 percent and 70 percent figures acceptable in absolute terms? We are fortunate in having comparable data from the civilian sector for this criterion. In 1976, Kane and coworkers fielded an encounter form among physician preceptors and their MEDEX (a type of physician assistant) in private offices throughout the state of Utah. The data from Utah showed that Utah physicians obtained throat cultures for pharyngitis 58 percent of the time (compared to the Air Force physicians' rate of 52 percent) while the MEDEX in Utah obtained throat cultures for pharyngitis

68 percent of the time (compared to the Air Force physician assistants' rate of 70 percent).* These percentages show that Air Force performance levels are comparable to levels reached in the civilian sector. This similarity of levels also bolsters our confidence in the rest of our observations.

If a patient is seen in the outpatient department and the diagnosis of pneumonia is made for the first time, a chest x-ray should be performed. This criterion would seem to be an absolute one, but that is not necessarily so. For patients whose diagnosis of pneumonia is being made for the first time in the outpatient area, it is difficult to imagine how the diagnosis could be properly made without obtaining a chest x-ray. However, it is possible that certain patients seen for the first time in the outpatient area with pneumonia were actually being followed up after a recent hospitalization for pneumonia. In the case of a follow-up visit, the provider of care might have decided that a chest x-ray was not yet needed, because the patient had been in the hospital so recently. Thus, we would not expect high percentage compliance with this criterion. In fact, physicians and physician assistants performed at approximately the same level in obtaining chest x-rays for patients with pneumonia (the number of patients seen by physician assistants is quite small, however).

It is generally agreed that, if the diagnosis of urinary tract infection is to be made, some objective evidence of the urinary tract infection must be obtained. That is, it is not acceptable to make the diagnosis and begin treatment on the basis of symptoms alone. Therefore, we specified that either a urinalysis or urine culture had to be obtained on the first visit at which the diagnosis of urinary tract infection was made. Note that many experts would require both tests, or at least a urine culture, in order to make the diagnosis; however, we agreed to accept either a urinalysis or a culture. In fact, 61 percent of patients seen by the physician had a urinalysis or a culture when the diagnosis of urinary tract infection was being

* Kane, R. L., Olsen, D. M., Castle, C. H.: Medex and their physician preceptors. J Am Med Assoc 236:2509-2512, 1976

made, as compared to 79 percent of those patients seen by physician assistants. The difference is statistically significant.

The "urinalysis group" refers to a group of diagnoses for which it is likely that obtaining a urinalysis would contribute to good care. The urinalysis group includes not only urinary tract infection, but also diagnoses such as urolithiasis (stones), urethritis, benign prostatic hypertrophy, and other diseases of the urinary system. Because it is more broadly defined, this criterion is also more questionable. The degree of compliance would be expected to be lower, as in fact it is.

It was reasoned that if the diagnosis was diabetes mellitus, a blood sugar test should have been obtained on the first visit for the condition. It was not done very often, which might be explained by the fact that the patient had been transferred from some other facility, or was being followed up after hospitalization. In any case, there is no statistically significant difference, although the number of patients with this condition seen by physician assistants is very small.

"No diagnosis at this time" was a bona fide check-off category on the Patient Contact Record. It was there to permit providers who were still quite uncertain of the diagnosis not to have to check a more specific diagnosis. We reasoned that if the patient presented such a riddle that no diagnosis could be made at the time of the first visit, then a complete blood count (which includes hematocrit or hemoglobin, white blood count and differential cell count) would be warranted. The data show that for large numbers of patients, physicians and physician assistants obtained the CBC at approximately the same rate.

Finally, we set up a different kind of good care criterion: treatment of warts should require no more than two visits. In fact, virtually all cases of warts were handled in one or two visits, and were handled with equal dispatch by physicians and physician assistants.

Summarizing the information in the first table, the pattern of care shows that physician assistants are performing at least as well

as physicians, insofar as we can measure, when they treat these common conditions.

Most conditions in outpatient medicine are acute, so that attention to the first visit alone makes sense. However, there are certain conditions, whether acute or chronic, for which it is equally reasonable or more reasonable to look at an entire episode of care, in which case a criterion would require the provider to perform a certain action on at least one of a number of visits. Table 2 addresses the issue of technical quality of care rendered over time. The data come only from the two bases where data were collected for a complete six-month, rather than a two-week, period. The question here is: was the needed test ordered if it had not been ordered before? What we have before us is a "batting average" for each type of provider: the number of times the correct thing was done divided by the number of opportunities to do the correct thing. The formal fraction can be stated as follows:

$$\frac{\text{Number of times the provider ordered a needed test}}{\text{Number of occasions the provider should have ordered the test.}}$$

In other words, of the times a patient appeared in the office not yet having received a needed test, how often did the physician or physician assistant order that needed test?

It is important to consider that, in applying the criteria listed in Table 2, we are viewing episodes of illness exclusively from the beginning. That is, we have included the series of visits made by a patient only if we see the very first as well as subsequent visits made by the patient for a particular condition.

When we look at pneumonia, we find that in 46 percent of 50 visits to the physician where an x-ray still remained to be performed, the x-ray was ordered by the physician. Similarly, in 40 percent of the ten visits when a patient came to the physician assistant still needing an x-ray for pneumonia, that x-ray was ordered by the physician assistant. The difference is not statistically significant.

Table 2

TECHNICAL QUALITY OF CARE OVER TIME: WAS A NEEDED TEST ORDERED IF NOT ORDERED BEFORE?

Condition	Good Care Criterion	Compliance		Statistical Significance?
		MD	PA	
Pneumonia	Did x-ray, if not done since illness began	46% (n = 50)	40% (n = 10)	N.S.
UTI	Did U/A or culture, if not done since illness began	47% (n = 173)	81% (n = 69)	Yes--PA
Urinalysis group	Did U/A, if not done since illness began	30% (n = 396)	50% (n = 148)	Yes--PA
Diabetes	Ordered sugar, if not ordered before	47% (n = 287)	31% (n = 26)	N.S.
Anemia	Ordered CBC, if not ordered before	60% (n = 78)	70% (n = 10)	N.S.

NOTE: n = number of visits.

For urinary tract infection and the ordering of a urinalysis or culture, we again see the consistently superior performance of physician assistants in the area of ordinary urinary tract disease. Similarly, for the urinalysis group, physician assistants were significantly more likely to order a urinalysis which needed to be ordered.

If we look at the number of diabetics for whom we can observe initial and subsequent visits, we note that physicians still order necessary blood sugars more often than physician assistants, although the difference is not statistically significant.

Finally, both groups ordered CBCs fairly often when they were still needed in patients who carried the diagnosis of anemia.

To summarize Tables 1 and 2, it appears that physician assistants are rendering an acceptable quality of technical medical care. We will return to this point after we examine the next question, that of "mis-ordering".

UTILIZATION OF TESTS AND PROCEDURES: RESULTS

Appropriate ordering of tests and procedures is another important facet of good quality medical care. This section examines the question of appropriate utilization of tests and procedures in two ways: first, by comparing utilization rates for physicians and physician assistants across a number of tests and procedures; and second, by selecting specific tests or procedures (e.g., electrocardiogram, physical therapy) and analyzing whether or not they were employed in situations likely to have been inappropriate. As we shall see, the first method is highly objective, but the second method reveals more about the appropriateness of utilization.

We begin our examination of appropriateness of utilization by computing the number of times a specific test or procedure was ordered during 100 visits for a certain diagnosis or group of diagnoses.* Although it might be unwise to make value judgments concerning the suitable number of times that ordering should occur, we

*Appendix C lists the diagnoses comprising each group.

would be troubled if physicians and physician assistants were ordering at widely varying rates. These rates are also helpful to the administrator who wants to predict the number of tests that he can expect the staff to order.

With data collected during our 1974 survey, we have examined rates of ordering for the following tests or procedures: complete blood count, urinalysis, any type of x-ray, electrocardiogram, serum chemistry, and physical therapy. Table 3 shows gross rates of ordering these tests or procedures per 100 visits for patients seen only by a physician, or only by a physician assistant. Tests ordered when a patient saw both or neither of these two types of providers on a visit are excluded.*

Reviewing the rates, it is immediately apparent that there are no large absolute differences in rates of ordering for all problems taken as a group. For example, with the complete blood count, we find that physician assistants are ordering one more complete blood count per 100 visits than are physicians. Even though this difference is statistically significant, it is doubtful that there is any clinical or economic significance that can be attached to one additional complete blood count per 100 visits. We note that, for three of these tests, physician assistants order significantly more tests, while physicians order significantly more often for one of the tests.

However, this gross calculation does not get at the variables that may influence the ordering of tests. It does not really tell us if physician assistants are overutilizing or underutilizing tests and procedures in comparison to physicians. What variables may affect the rates of ordering tests? One is the patient mix: one type of provider might over-order a given test for one group of patients - yet, because it sees a smaller number of patients in this group, it might end up with the same gross ordering rate as another

* The number of visits varies slightly from test to test due to minor data inconsistencies.

Table 3
RATES OF ORDERING TESTS PER 100 VISITS

Test	MD		PA	
	Rate	No. of Visits	Rate	No. of Visits
Complete blood count	5.70	30349	6.57 ^b	7487
Urinalysis	5.70	30350	7.41 ^c	7487
Any x-ray	9.00	30345	8.51	7485
Electrocardiogram	2.01 ^a	30350	1.42 ^b	7487
Serum chemistry	2.33	30350	2.93 ^b	7487
Physical therapy	0.86	30350	0.81	7487

^aSignificant p ≤ .05.

^bSignificant p ≤ .01.

^cSignificant p ≤ .001.

type of provider that orders appropriately for a larger number of patients in this group. Another variable is the proportion of initial visits to return visits for a particular problem. If the ratio of initial visits to return visits differs for physicians as opposed to physician's assistants, the rate of ordering tests might well vary, because it is likely that more procedures would be ordered on an initial visit.

Only after these two variables are taken into account can we perform a more exacting analysis of different rates of ordering tests. Even then, we will be left with the question of the reason for any observed differences in ordering rates among different groups of providers. If higher ordering rates exist for one group as compared to another, will that be waste, or reasonable caution, or simply higher quality? We will have reached that ill-defined middle zone where quality and utilization are inseparable. The tables that follow specify a narrower range of diseases, in order to lessen the effect of patient mix on the results. Likewise, they separate initial from return visits.

As we turn to disease-specific rates of ordering tests, let us start with x-rays. Table 4 controls for disease category. "X-ray conditions" is the general term for a group of disorders, all of which might well require x-rays at some time, for some proportion of patients being seen. The four specific disease conditions listed, i.e., tension headache, acute and chronic sinusitis, backache, and arthritis and joint pain, are even more specific subsets of the general term "x-ray conditions". This table limits the count of visits to those encounters for which the specific diagnosis was the sole one listed on the Patient Contact Record. Now that we control for case mix, we notice dramatic changes in the numbers. Although, in Table 1, physicians showed a slightly higher rate of ordering x-rays for all diagnostic categories, we note that physician assistants have a slightly (but not significantly) higher rate of ordering x-rays for "x-ray conditions". In fact, they order more x-rays for each of the diagnostic subsets, and significantly more x-rays for acute and chronic sinusitis and arthritis and joint pain.

Table 4
X-RAYS PER 100 VISITS, FIRST AND RETURN

Condition	MD		PA	
	No. of X-rays	No. of Visits	No. of X-rays	No. of Visits
"X-ray conditions"	20.65	6236	22.61	1265
Tension headache	8.16	245	10.45 ^a	67
Sinusitis (acute and chronic)	12.02	341	19.69 ^a	127
Backache	13.87	757	15.84	284
Arthritis and joint pain	22.11	606	33.79 ^c	219

^a Significant p ≤ .05.

^b Significant p ≤ .01.

^c Significant p ≤ .001.

Table 5
X-RAYS PER 100 VISITS: DEFINITE FIRST AND
RETURN VISITS ONLY

Condition	MD		PA	
	No. of X-rays	No. of Visits	No. of X-rays	No. of Visits
<i>First Visits Only</i>				
"X-ray conditions"	23.5	2055	27.9 ^a	612
Tension headache	11.4	105	11.1 ^a	36
Sinusitis (acute and chronic)	6.8	118	18.5 ^a	65
Backache	16.4	272	23.3 ^b	133
Arthritis and joint pain	28.9	204	44.3 ^c	120
<i>Return Visits Only</i>				
"X-ray conditions"	16.2	2958	15.1	476
Tension headache	4.8	105	9.1	22
Sinusitis (acute and chronic)	14.4	153	22.2	45
Backache	9.2	325	8.7	115
Arthritis and joint pain	13.8	269	16.7	72

^a Significant p ≤ .05.

^b Significant p ≤ .01.

^c Significant p ≤ .001.

Is this overutilization, or is it higher quality of care?

Table 5 permits us to get closer to the answer (but not to reach it) by controlling for definite first visits versus definite return visits.* When we look at the differences in ordering rates for first visits and return visits, it is apparent that, with the single exception of acute and chronic sinusitis, x-ray rates are, as expected, higher for first visits than for return visits. In the case of sinusitis, the ordering rates for both physicians and physician assistants increase on return visits, which suggests that both types of providers become more concerned if the patient is not progressing satisfactorily at the time of a return visit. For both first visits and return visits, physician assistants generally order more x-rays for these conditions than do physicians, although the differences narrow (with the exception of tension headache) upon return visits.

For sinusitis, arthritis and joint pain, there are large and significant differences in x-ray rates on first visits. In the case of sinusitis, it is impossible to guess if the patients required the x-rays. For arthritis and joint pain, the physician assistants' ordering rate of more than 44 x-rays per 100 visits is so high that one might well question whether all the x-rays were necessary.

Turning now to a procedure, physical therapy (Tables 6 and 7), we note that physicians order more physical therapy for a group of conditions where it might well be warranted. The difference is not statistically significant. The two sub-groups selected for physical therapy--arthritis and joint pain, and backache--also show higher ordering rates for physicians. These differences persist when first and return visits are looked at separately (Table 7), although now physician assistants order slightly more physical therapy for arthritis and joint pain on first visit. It seems clear that physician assistants are not overloading the physical therapy department in comparison to physicians. On the other hand, it is quite possible

* In Table 3, the total number of visits is lower than in previous x-ray tables because we have discarded all visits with ambiguous first or return status, or with unindicated first or return status. We include only those visits which we are certain are first visits or return visits.

Table 6

PHYSICAL THERAPY PER 100 FIRST
AND RETURN VISITS

Condition	MD		PA	
	Rate	No. of Visits	Rate	No. of Visits
"Physical therapy group"	5.26	4281	4.82	871
Arthritis and joint pain	4.11	608	1.83	219
Backache	6.89	755	6.67	285

Table 7

PHYSICAL THERAPY PER 100 VISITS: FIRST VISITS
VERSUS RETURN VISITS

Condition	MD		PA	
	Rate	No. of Visits	Rate	No. of Visits
<i>First Visits Only</i>				
"Physical therapy group"	5.6	1475	4.6	483
Arthritis and joint pain	2.4	205	3.3	120
Backache	8.5	272	5.3	126
<i>Return Visits Only</i>				
"Physical therapy group"	5.8	1942	5.4	315
Arthritis and joint pain	4.1	270	0.0	72
Backache	4.6	324	8.6	106

that physician assistants are not ordering as much physical therapy as might be consistent with good quality. If there were reason to suspect that this were the case, it would be possible to review a group of charts bearing specific diagnoses to decide if a problem existed.

Table 8 begins more detailed consideration of electrocardiograms per 100 visits. Unlike the gross ordering rate for electrocardiograms, in which physicians ordered more, when we look at the "ECG conditions", we now see physician assistants ordering electrocardiograms at a slightly higher, but not statistically significant rate. The subset entitled ischemic heart disease and other heart disease shows an even greater difference in the rate of ordering electrocardiograms, but the number of visits handled by physician assistants is too small to draw any conclusions with confidence. Once again, we note that ordering rates decrease considerably from first visit to return visit both for physicians and for physician assistants. The most reasonable conclusion to draw is that electrocardiograms are not being grossly overordered by physician assistants, and that there would be little to gain by investigating further in this area.

Table 9 shows ordering rates for serum chemistries or electrolytes per 100 visits when the analysis is limited to disease conditions belonging to the "ECG group". Physician assistants consistently order more tests. Whether physicians order too few, or physician assistants too many, or in fact if there is a problem at all, is a question which might be selected for investigation.

Finally, Table 10 shows that the difference in rate of ordering urinalysis per 100 visits for all conditions is intensified when the single diagnosis of urinary tract infection is considered. An investigator might wish to examine the possible reasons for this difference. Such investigation would require chart review.

Review of utilization rates for ordering tests or procedures is disappointing, in that definite conclusions cannot be reached. Even after case mix and initial versus return visit are controlled for, it still remains impossible to determine if we are dealing with differences attributable to different quality of care or to differing patterns of utilization. However, utilization analysis does signal

Table 8
ELECTROCARDIOGRAMS PER 100 VISITS

Condition	MD		PA	
	Rate	No. of Visits	Rate	No. of Visits
<i>First and Return Visits</i>				
"ECG group"	8.96	2580	10.28	282
Ischemic and other heart disease	24.65	507	37.5	24
<i>First Visits Only</i>				
"ECG group"	17.4	431	16.7	54
Ischemic and other heart disease	37.8	90	33.3	6
<i>Return Visits Only</i>				
"ECG group"	6.3	1912	7.5	174
Ischemic and other heart disease	18.7	331	42.9 ^a	14

^aSignificant p < .05.

Table 9

SERUM CHEMISTRY--ELECTROLYTES PER 100 VISITS
FOR "ECG GROUP" ONLY

Type of Visit	MD		PA	
	Rate	No. of Visits	Rate	No. of Visits
First and return	11.46	2680	20.0 ^a	280
First only	13.7	431	23.1	52
Return only	8.4	1912	20.1 ^a	174

^aSignificant p ≤ .05.

^bSignificant p ≤ .01.

^cSignificant p ≤ .001.

Table 10

URINALYSIS PER 100 VISITS FOR URINARY
TRACT INFECTION ONLY

Type of Visit	MD		PA	
	Rate	No. of Visits	Rate	No. of Visits
First and return	45.2	598	73.1 ^b	160
First only	59.6	188	78.9 ^a	76
Return only	32.5	277	65.3 ^b	72

^aSignificant p ≤ .0.

^bSignificant p ≤ .001.

potential problem areas. If desired, it would be possible to follow up, by means of chart review, any significant difference discovered. Use of this method can therefore serve as a flagging device for uncovering areas where chart review might permit more certain conclusions to be drawn concerning the presence of high or low quality, or too high or too low utilization of services.

As mentioned at the beginning of this utilization section, there is a second method for investigating possible inappropriate utilization, i.e., selecting specific tests or procedures and analyzing whether or not they were employed in situations likely to have been inappropriate. We now turn to this second method. Table 11 presents data concerning patterns of possible "mis-ordering". The word "mis-ordering" is put in quotation marks because we are presenting possible rather than definite misutilization of tests, procedures, or therapy. The procedures outlined in Table 11 were probably not warranted, given the situation specified. However, one person's "waste" is another person's "reasonable caution", and we will have to mention this caveat again.

The first two procedures presented in Table 11 form a group. They look at the fraction:

$$\frac{\text{Number of procedures ordered}}{\text{Number of patients with the condition.}}$$

Coryza means runny nose, and it is unlikely, when runny nose was the only diagnosis, that a throat culture should have been taken. Although there are likely to be some exceptions, we would like to see a very low rate of ordering of throat cultures in patients with runny nose. In fact, when coryza was the only diagnosis, a throat culture was infrequently ordered both by physicians and physician assistants, both groups having seen a large number of such patients. The difference is not statistically significant, although physician assistants ordered more throat cultures than physicians.

Similarly, it is unlikely that the first visit for asthma is sufficient in and of itself to stimulate the provider to order an x-ray. In fact, under these circumstances x-rays were infrequently

Table 11
PATTERN OF POSSIBLE "MIS-ORDERING"

Procedure	MD		PA		Statistical Significance?
	"Mis-ordering"	No. of Instances	"Mis-ordering"	No. of Instances	
	Rate		Rate		
Throat culture for coryza only	20%	228	26%	286	N.S.
First-visit x-ray for asthma	10%	81	20%	10	N.S.
ECG for inappropriate diagnoses	16%	387	28%	53	Yes
Physical therapy for inappropriate diagnoses	6%	174	13%	54	N.S.
X-ray for inappropriate diagnoses	6.3%	7887	5.7%	3346	N.S.

ordered by both physician assistants and physicians, although the number of patients seen by the physician assistants is small.

The next two criteria presented in Table 11 comprise another group. The fraction is:

$$\frac{\text{Number of procedures of a specified type "not needed"}}{\text{Number of procedures of a specified type performed}}$$

The question addressed by the first criterion in this group is: Were electrocardiograms ordered for inappropriate diagnoses? In order to approach this question, we first made a list of diagnoses for which electrocardiograms are likely to be appropriate. We then counted the number of electrocardiograms which were ordered for diagnoses which did not appear on the "appropriate" list. Of 387 electrocardiograms ordered by physicians, 16 percent of them were ordered for diagnoses for which it would be unusual to need an electrocardiogram. For physician assistants, 28 percent of the 53 electrocardiograms they ordered were for diagnoses for which electrocardiograms were unlikely to be appropriate. The difference is statistically significant in favor of the physicians.

The next criterion shows that physical therapy was rarely ordered for inappropriate diagnoses, although it was more often ordered by physician assistants.

The final criterion in Table 11 concerns inappropriate ordering of x-rays. The fraction here is:

$$\frac{\text{Number of x-rays ordered on visits for diagnoses not on the "x-ray appropriate" list}}{\text{Total number of visits for diagnoses not on the "x-ray appropriate" list}}$$

$$\frac{\text{Total number of visits for diagnoses not on the "x-ray appropriate" list}}{\text{Total number of visits for diagnoses not on the "x-ray appropriate" list}}$$

Again, we made a list of diagnoses for which taking an x-ray is likely to be appropriate. We then looked at the number of visits for all other (x-ray "not needed") diagnoses, and computed how often x-rays were ordered during visits for these inappropriate diagnoses. On thousands of visits, both physicians and physician assistants rarely

ordered x-rays for inappropriate diagnoses, although physicians did order them slightly more frequently (inappropriately) than did physician assistants.

In summary, looking at the pattern of utilization, we note that in four of the five situations listed, physician assistants did "misorder" more often than physicians. However, in only one of the situations was statistical significance reached. We conclude that there is a mild tendency for physician assistants to order more. The question must again be raised: Is this fairly mild degree of misordering to be called "waste" or to be called "reasonable caution" on the part of providers who are less fully trained and therefore might need more back-up, which they could obtain by ordering more tests? Of course, this question cannot be answered with the data at hand.

III. CONCLUSIONS

We therefore conclude that the Air Force can deliver the same quality of medical care when physician assistants treat some of the patients formerly treated by physicians, and that no quality bar exists to the continued training and employment of physician assistants in Air Force outpatient clinics. In a sense, our data provide the medical go-ahead for physician assistants. We find the quality of care they deliver to be acceptable when they are providing care for the types of problems they have been trained to treat.

Insofar as we can measure with our criteria, for routine, outpatient conditions, physician assistants are safe, and they deliver a technical process quality of care at least equal to that of physicians. Our finding that physician assistants treat at least as well as physicians for the problems we were able to study is consistent with other published evidence.*

There is a mild tendency for physician assistants to over-order some tests and procedures. If the over-ordering is truly misordering (again raising the question of waste versus reasonable caution), then there appears to be only a mild amount of misordering of some--not all--tests and procedures by the physician assistants as compared to the physicians.

The performance of physician assistants, as measured by these 1974 data, constitutes a strong endorsement of the Air Force's in-house physician assistant training program. It would behoove the Air Force to consider the proven quality of its in-house training before attempting to substitute one or more untested civilian training programs.

Beyond this, any further work on physician assistant quality of care depends on new data, which will soon be forthcoming. With the approval and encouragement of the Air Force Surgeon General, four

*See Appendix B.

Air Force bases commenced a demonstration program proposed by Rand on the basis of information gathered between 1974 and 1976. Although the demonstration program consists of a number of different elements, the main one is the use of a much richer mix of physician assistants and primary care nurse practitioners in outpatient clinics. At these four demonstration bases, the provision of general medical ambulatory care is carried out by teams of providers consisting of two or three physician extenders (physician assistants or primary care nurse practitioners) working with one physician.

The demonstration program began in the autumn of 1976. In the spring and summer of 1977, a revised Patient Contact Record was fielded at each of these bases. The revised PCR is specifically designed to provide increased information relevant to the issue of the everyday quality of care provided by physician extenders and physicians in Air Force outpatient clinics. In addition to the comparison of physicians' and physician assistants' performance, such as was possible with the 1974 data, we will also take the opportunity to evaluate the performance of the first few classes of physician assistants produced by the Air Force as compared with the performance of the more recent graduates of the training program. Finally, we should also be able to provide some information on the performance of primary care nurse practitioners.

Appendix A

PATIENT CONTACT RECORD

ENCLOSURE PAGE BLANK

(11-21)
TIME OF PATIENT ARRIVAL

(22-26)
TIME PATIENT IS CALLED TO EXAMINATION OR TREATMENT ROOM

(27-31)
TIME PATIENT CONTACT RECORD IS TURNED IN

(28-30) OUTPATIENT UNIT:

- | | | | | |
|--|---|--|---|---|
| <input type="checkbox"/> 1. AIR FORCE CLINIC (FAMILY PRACTICE
OR GENERAL THERAPY) | <input type="checkbox"/> 5. SICK CALL | <input type="checkbox"/> 9. EYE CLINIC | <input type="checkbox"/> 13. PODIATRY | <input type="checkbox"/> 17. UROLOGY |
| <input type="checkbox"/> 2. FLIGHT SURGEON'S CLINIC | <input type="checkbox"/> 6. ALLERGY | <input type="checkbox"/> 10. MEDICINE | <input type="checkbox"/> 14. PEDIATRICS | <input type="checkbox"/> 18. PHYSICAL THERAPY |
| <input type="checkbox"/> 3. PHYSICAL EXAM SECTION | <input type="checkbox"/> 7. DERMATOLOGY | <input type="checkbox"/> 11. OB-GYN | <input type="checkbox"/> 15. PSYCHIATRY | <input type="checkbox"/> 19. INHALATION THERAPY |
| <input type="checkbox"/> 4. EMERGENCY ROOM/WALK-IN CLINIC | <input type="checkbox"/> 8. ENT | <input type="checkbox"/> 12. ORTHOPEDICS | <input type="checkbox"/> 16. SURGERY | <input type="checkbox"/> 20. OTHER: _____ |

PATIENT CONTACT RECORD

Approved Headquarters USAF: SCN 74-25

INSTRUCTIONS

PLEASE ANSWER ALL QUESTIONS BY PLACING
AN "X" IN THE APPROPRIATE BOX (FOR EXAMPLE)
OR BY FILLING IN THE BLANKS AS INDICATED.

PATIENTS FILL OUT "PART I PATIENT INFORMATION"

HEALTH CARE PROFESSIONALS FILL OUT "PART II AND III"

THE PATIENT CONTACT RECORD IS TO BE COMPLETED AND
TURNED IN TO CORPSMAN BEFORE THE PATIENT LEAVES.

Nº 2072890

PART I Patient Information

TO BE FILLED OUT BY PATIENT

1 (PATIENT'S) SOCIAL SECURITY NUMBER:
(SSN) _____ / _____ / _____

2 SERVICE OF PATIENT OR PATIENT'S SPOUSE:
■ 1. AIR FORCE
 2. ARMY
 3. NAVY
 4. MARINE CORPS
 5. COAST GUARD
 6. CADET/APPLICANT FOR MILITARY SERVICE
 7. OTHER _____

3 PAY GRADE OF PATIENT OR PATIENT'S SPOUSE. (IF RETIRED, CHECK GRADE AT RETIREMENT).
(R1-R9)
■ 1. E1
 2. E2
 3. E3
 4. E4
 5. E5
 6. E6
 7. E7
 8. E8, E9
 9. W1-W4
 10. O-1
 11. O-2
 12. O-3
 13. O-4
 14. O-5
 15. O-6
 16. O-7 TO 10
 17. NOT SURE; ENTER RANK (FOR EXAMPLE, STAFF SERGEANT, FIRST LIEUTENANT, ETC.) _____

5 PATIENT'S SEX:
(M) 1. MALE
 2. FEMALE

6 PATIENT'S MARITAL STATUS:
(M) 1. NOT APPLICABLE (PATIENT A CHILD)
 2. SINGLE
 3. MARRIED
 4. SEPARATED/DIVORCED
 5. WIDOW/WIDOWER

7 PATIENT'S ETHNIC GROUP:
(E1) 1. WHITE
 2. BLACK
 3. ORIENTAL
 4. AMERICAN INDIAN
 5. SPANISH AMERICAN
 6. OTHER _____

8 PATIENT'S MILITARY STATUS:
(M) 1. SPOUSE OR DEPENDENT OF ACTIVE MILITARY
 2. SPOUSE OR DEPENDENT OF RETIRED OR DECEASED MILITARY
 3. ACTIVE MILITARY
 4. RETIRED MILITARY

9 DO YOU (THE PATIENT) LIVE ON THIS BASE?
(L) 1. YES
 2. NO

10 IF "NO":

(L) a. APPROXIMATELY HOW MANY MILES AWAY? _____ MILES

(L) b. WILL YOU DO OTHER ERRANDS DURING YOUR VISIT TO THIS BASE?

1. YES
 2. NO

11 DID YOU MAKE AN APPOINTMENT FOR THIS VISIT?
(A) 1. YES
 2. NO

12 IF YOU HAD AN APPOINTMENT:

(P-40) c. ABOUT HOW MANY DAYS AGO WAS THE APPOINTMENT MADE? (ENTER 0 IF MADE TODAY.)

_____ DAYS

(P-40) d. WHAT WAS THE TIME OF THE APPOINTMENT?

_____ :

13 COMPARED TO OTHER PERSONS THE PATIENT'S AGE, WOULD YOU SAY THE PATIENT'S HEALTH IS:

- (M) 1. EXCELLENT
 2. GOOD
 3. FAIR
 4. POOR

IF YOU ARE COMPLETING THIS FORM FOR
A CHILD, ANSWER QUESTIONS 14 THRU 16
FOR YOURSELF, NOT FOR YOUR CHILD

14 HIGHEST GRADE OR CLASS YOU HAVE COMPLETED IN CIVILIAN SCHOOL:

- (M) 1. NONE
 2. GRADES 1 TO 6
 3. GRADES 7 TO 9
 4. GRADES 10 TO 11
 5. GRADE 12 (COMPLETED
HIGH SCHOOL)
 6. POST-SECONDARY TECHNICAL
OR BUSINESS SCHOOL
 7. SOME COLLEGE
 8. GRADUATED FROM COLLEGE
(BACHELOR'S DEGREE)
 9. GRADUATE DEGREE (MASTER'S
PH.D., M.D., ETC.)

QUESTIONS 15 & 16 SHOULD BE ANSWERED
BY DEPENDENTS AND RETIREES ONLY

15 ARE YOU EMPLOYED?

- (P-7) 1. YES
 2. NO

16 IF "YES":

(P-7) a. HOW MANY HOURS PER WEEK DO YOU WORK? _____ HOURS.

(P-7) b. WHAT ARE YOUR EARNINGS?

\$ _____ PER

- (P) 1. HOUR
 2. WEEK
 3. MONTH
 4. YEAR

THE FOLLOWING QUESTIONS MUST BE ANSWERED
AT THE END OF THE PATIENT'S VISIT

17 IN YOUR VISIT TODAY, APPROXIMATELY HOW MUCH TIME WAS SPENT WITH THE DOCTOR,
IF ANY?

(P)	NONE	LESS THAN A MIN	1-5 MIN	5-10 MIN	10-30 MIN	30-30 MIN	MORE THAN 30 MIN.
	<input type="checkbox"/>						

18 HOW MUCH TIME WAS SPENT WITH THE PHYSICIAN ASSISTANT (IDENTIFIED BY THE BLUE
EMBLEM "PA" ON HIS JACKET), IF ANY?

(P)	NONE	LESS THAN A MIN	1-5 MIN	5-10 MIN	10-30 MIN	30-30 MIN	MORE THAN 30 MIN
	<input type="checkbox"/>						

19 HOW MUCH TIME WAS SPENT WITH THE CORPSMAN, IF ANY?

(P)	NONE	LESS THAN A MIN	1-5 MIN	5-10 MIN	10-30 MIN	30-30 MIN	MORE THAN 30 MIN
	<input type="checkbox"/>						

20 HOW MUCH TIME WAS SPENT WITH THE NURSE, IF ANY?

(P)	NONE	LESS THAN A MIN	1-5 MIN	5-10 MIN	10-30 MIN	30-30 MIN	MORE THAN 30 MIN
	<input type="checkbox"/>						

21 HOW MUCH TIME WAS SPENT WITH OTHER HEALTH CARE PROFESSIONALS, IF ANY?

(P)	NONE	LESS THAN A MIN	1-5 MIN	5-10 MIN	10-30 MIN	30-30 MIN	MORE THAN 30 MIN
	<input type="checkbox"/>						

22 WHAT TYPE OF MEDICAL PERSON PROVIDED THE MAIN TREATMENT? (CHECK ONLY ONE.)

- (P) 1. DOCTOR
 2. PHYSICIAN ASSISTANT
 3. NURSE
 4. CORPSMAN
 5. OTHER
 6. NOT SURE

PART II Diagnostic Information

TO BE COMPLETED BY THE HEALTH CARE PROFESSIONAL(S) ONLY

23 STATUS OF VISIT (CHECK ANY BOX THAT APPLIES):

- (34) 1. NEW PATIENT TO CLINIC
- (35) 2. NEW PATIENT TO PRACTITIONER
- (36) 3. FIRST VISIT FOR MAIN PROBLEM OR PROCEDURE
- (37) 4. RETURN VISIT FOR MAIN PROBLEM OR PROCEDURE
- (38) 5. REFERRAL PATIENT

24 PROPHYLACTIC PROCEDURES PERFORMED (CHECK THE BOX THAT APPLIES):

- (39-40) 1. WELL ADULT EXAM
- 2. WELL CHILD EXAM
- 3. FLIGHT PHYSICAL (CLASS 1)
- 4. FLIGHT PHYSICAL (CLASS 2 OR 3)
- 5. SEPARATION/RETIREMENT PHYSICAL
- 6. OTHER NON-FLYING (ADMINISTRATIVE) PHYSICAL
- 7. EYE EXAM
- 8. ROUTINE GYM EXAM
- 9. PRENATAL VISIT
- 10. POSTPARTUM VISIT
- 11. POST-OP FOLLOW-UP
- 12. OTHER: _____

25 ID NUMBER OF PERSON(S) MAKING DIAGNOSIS (ENTER IN APPROPRIATE SPACE):

(41-55) DR. / PA / NURSE / CORPSMAN / OTHER

26 PROBLEMS/AREAS TREATED (CHECK ALL BOXES THAT APPLY):

- 1. COMMUNICABLE DISEASES
 - (56-70) 5 INFECTIOUS INTESTINAL
 - 23 VIRAL SYNDROME (GASTROENTERITIS)
 - 11-16, 19 OTHER VIRAL DISEASES
 - 901 OTHER: _____
- 2. NEOPLASMS
 - 50-60 MALIGNANT
 - 70-74 BENIGN
 - 902 OTHER: _____
- 3. ALLERGIC, ENDOCRINE, METABOLIC, NUTRITIONAL
 - 65 RAY FEVER
 - 66 ASTHMA
 - 68-70 THYROID DISEASE
 - 91 DIABETES MELLITUS
 - 93 GOUT
 - 95 SPECIFIC ALLERGIES
 - 101 OBESITY
 - 903 OTHER: _____
- 4. BLOOD AND BLOOD-FORMING ORGANS
 - 111 IRON DEFICIENCY (HYPOCHROMIC) ANEMIA
 - 904 OTHER: _____

5. MENTAL ILLNESS, PERSONALITY DISORDERS

- 124-129 PSYCHOSIS
- 130, 134 ANXIETY OR DEPRESSIVE NEUROSIS
- 135 PHYSICAL DISORDER OF PRESUMABLY PSYCHOGENIC ORIGIN
- 136 PERSONALITY DISORDERS
- 139 DRUG ABUSE
- 147 TENSION HEADACHE
- 600 ADULT SITUATION DISTURBANCE
- 601 NO PSYCHIATRIC DISEASE
- 905 OTHER: _____

6. DISEASES OF NERVOUS SYSTEM & SENSE ORGANS

- 155-160 CNS DISEASES
- 165-169 DISEASES OF THE NERVOUS SYSTEM & GANGLIA
- 170 CONJUNCTIVITIS & OPHTHALMIA
- 171-174 OTHER INFLAMMATORY EYE DISEASES
- 178 STRABISMUS
- 180 GLAUCOMA
- 602 MYOPIA
- 603 HYPEROPIA
- 604 ASTIGMATISM
- 605 TROPIA-PHORIA
- 175-177, 179, 181 OTHER EYE DISEASES
- 182 OTITIS EXTERNA
- 183, 184 OTITIS MEDIA
- 187 WAX IN EAR
- 612 SENSORY NEURAL HEARING LOSS
- 613 CONDUCTIVE HEARING LOSS
- 161, 165-166, 168-170 OTHER DISEASES OF THE EAR
- 906 OTHER: _____

7. CIRCULATORY SYSTEM

- 211, 212 ISCHEMIC HEART DISEASES
- 216 BENIGN HYPERTENSION
- 213-217 OTHER HEART DISEASES
- 221, 223 DISEASES OF ARTERIES, ARTERIOLES & CAPILLARIES
- 225 HEMORRHOIDS
- 224, 226-227 OTHER DISEASES OF VEINS & LYMPHATICS
- 907 OTHER: _____

8. RESPIRATORY

- 240 CORYZA (NON-FEBRILE COMMON COLD)
- 241, 245 FEBRILE COLD & INFLUENZA
- 242 PHARYNGITIS (INCL. FEBRILE SORE THROAT & TONSILLITIS)
- 243 ACUTE SINUSITIS
- 244 LARYNGITIS & TRACHEITIS
- 246 PNEUMONIA PNEUMONITIS
- 247 ACUTE BRONCHITIS
- 248 CHRONIC BRONCHITIS
- 249 HYPERTROPHY OF TONSILS & ADENOIDS
- 250 CHRONIC SINUSITIS

- 255 EMPHYSEMA
 614 NASAL-SEPTAL DEFORMITY
 900 OTHER _____
- 9. DIGESTIVE**
- 273, 274, 279-281 DISEASES OF ESOPHAGUS, STOMACH, DUODENUM
 283, 284 HERNIAS OF ABDOMINAL CAVITY
 282, 285, 289 DISEASES OF INTESTINE & PERITONEUM
 287 CHOLECYSTITIS
 304 ABDOMINAL PAIN OTHER THAN COLIC
 615 INFLAMMATION OF SALIVARY GLANDS
 900 OTHER _____
- 10. GENITO - URINARY SYSTEM**
- 313, 314 URINARY INFECTION (CYSTITIS/PYELITIS/PYELONEPHRITIS)
 311, 312 UROLITHIASIS (STONES)
 315 URETHRITIS (NON-VENEREAL)
 316-317 OTHER DISEASES OF URINARY SYSTEM (INCL. PROSTATITIS)
 318 BENIGN PROSTATIC HYPERPLASIA
 319-321 OTHER DISEASES OF MALE GENITALIA
 322 BREAST DISEASE OTHER THAN NEOPLASM
 323 SALPINGITIS & OOPHORITIS (NON-VENEREAL)
 325 VULVITIS, VAGINITIS & CERVICITIS (NON-VENEREAL)
 327-330, 334 DISORDERS OF MENSTRUATION
 332 CERVICAL EROSION
 331 OTHER DISEASES OF FEMALE GENITALIA
 406 INFERTILITY
 910 OTHER _____
- 12. SKIN AND CELLULAR TISSUE**
- 21 DERMATOPHTHOSIS
 25 WARTS
 309 ACNE
 371, 372, 374 CELLULITIS
 373 IMPETIGO
 370-381 DERMATITIS (INCL. ECZEMA)
 370, 372, 377 OTHER LOCAL INFECTIONS OF SKIN & SUBCUTANEOUS TISSUE
 384, 385 COCONS/OTHER HYPERTROPHIC/ATROPHIC SKIN CONDITIONS
 387 DISEASES OF NAIL AND NAIL BED
 389 DISEASES OF SWEAT & SEBACEOUS GLANDS (INCL. SEBACEOUS CYST)
 394 INSECT BITES
 390 RASH
 616 PILONIDAL CYST
 912 OTHER _____
- 13. BONES & ORGANS OF MOVEMENT**
- 405 OSTEOARTHRITIS
 406 RHEUMATOID ARTHRITIS
 407-409 OTHER ARTHRITIS/RHEUMATISM
 410, 411 INTERNAL KNEE DERANGEMENTS
 420-422 BURSITIS, TENOSYNOVITIS, SYNOVITIS
 423-425 BACKACHE, BACK PAIN
 426 PAIN IN JOINT
 913 OTHER _____

16. SIGNS, SYMPTOMS & ILL-DEFINED CONDITIONS

- 916 NO DIAGNOSIS AT THIS TIME

17. ACCIDENT, POISONINGS & VIOLENCE

- 445, 464 ACCIDENTAL ENTRY OF FOREIGN BODY
 472-477 FRACTURE OF UPPER LIMB
 468, 469, 476 FRACTURE OF LOWER LIMB
 475 OTHER FRACTURE
 607 SPRAIN/STRAIN UPPER LIMB
 608 SPRAIN/STRAIN LOWER LIMB
 609 SPRAIN/STRAIN NECK/BACK
 610 OTHER SPRAIN/STRAIN
 483 LACERATIONS, CONTOUSIONS, ABRASIONS, SUPERFICIAL INJURIES
 485-487 BURNS
 496 ADVERSE EFFECT OF DRUGS
 611 ANIMAL BITES
 917 OTHER: _____

19. OTHER

- 919 OTHER: _____

27. DISPOSITION OF VISIT:

- (71-72) 1. NO FORMAL FOLLOW-UP PLANNED
 2. POSSIBLE FOLLOW-UP
 3. DEFINITE TELEPHONE FOLLOW-UP
 4. DEFINITE RETURN APPOINTMENT
 5. REFER^o TO OTHER CLINIC ON THIS VISIT
(SPECIFY BY NAME): _____

6. REFER TO OTHER CLINIC FOR FUTURE APPOINTMENT
(SPECIFY BY NAME): _____

7. REFER TO CHAMPU'S
 8. ADMIT TO QUARTERS
 9. ADMIT TO HOSPITAL
 10. RETURN TO REFERRING CLINIC (SPECIFY BY NAME):

11. OTHER: _____

(73-74) _____

28. IN ADDITION TO THE PRIMARY PATIENT DESCRIBED ABOVE, WAS AN ADDITIONAL, UN-SCHEDULED PATIENT TREATED ON THIS VISIT (NO YELLOW CARD)?

- (75) 1. YES
 2. NO

29. a. DID THE TREATMENT OF THE PRIMARY PATIENT DESCRIBED ABOVE INVOLVE CONSULTATION WITH ANOTHER HEALTH CARE PROFESSIONAL?

- (76) 1. YES
 2. NO

(77-78) b. IF YES, ENTER NAME OR ID NUMBER OF PERSON CONSULTED: _____

PART III Treatment Information

TO BE COMPLETED BY THE HEALTH CARE PROFESSIONAL(S) ONLY

30 ID NUMBER OF EACH PERSON WHO TREATS PATIENT (ENTER IN APPROPRIATE SPACE):

CARD 2 _____ / _____ / **MORSE** / **CORPSMAN** / **OTHER**

IN THE QUESTIONS WHICH FOLLOW, EACH HEALTH PROFESSIONAL SHOULD CHECK OFF APPROPRIATE BOXES IN HIS OR HER COLUMN.

31 TESTS (CHECK ALL APPLICABLE BOXES):

a. SPECIMENS COLLECTED.

- (26) THROAT CULTURE
 - (27) CULTURE—GENITAL TRACT
 - (28) PAP SMEAR
 - (29) WET PREP
 - (30) CULTURE—OTHER SOURCES
 - (31) BIOPSY
 - (32) OTHER _____

D. DIAGNOSTIC PROCEDURES:

- (23) AUDIOPHARM
 - (24) CATHETERIZATION (BLADDER)
 - (25) LARYNGOSCOPY
 - (26) PROCTOSCOPY/SIGMOIDOSCOPY
 - (27) OTHER _____

A grid of 20 empty square boxes arranged in four columns and five rows. This visual representation is used for a handwriting practice exercise.

c. ORDER TESTS—ROUTINE

- BLOOD COUNT/CRBC
 - URINALYSIS
 - X-RAY
 - EEG
 - SERUM CHEMISTRY/ELECTROLYTES
 - BLOOD SUGAR
 - LIPIDS
 - BUN—CREATININE
 - STOOL CULTURE
 - OTHER.

A grid of 40 empty square boxes arranged in 5 columns and 8 rows. The boxes are outlined in black and have a light gray fill.

4. ORDER TESTS—STAT

- 100 BLOOD COUNT/CRBC
 - 101 URINALYSIS
 - 102 X-RAY
 - 103 ECG
 - 104 OTHER.....

A grid of 20 empty square boxes arranged in five columns and four rows. This visual representation is used for a handwriting practice exercise.

32 GENERAL TREATMENT PROCEDURES PERFORMED (CHECK ALL APPLICABLE ITEMS):

a. GENERAL OFFICE SURGERY:

- (53) ADMINISTER LOCAL ANESTHESIA
 - (54) DEBRIDEMENT
 - (55) SUTURE
 - (56) REMOVE SUTURES
 - (57) APPLY, CHECK, CHANGE, DRESSING
 - (58) INCISE AND DRAIN ABSCESS/CYST
 - (59) REMOVE MOLE/EXCISE WART OR WEN
 - (60) OTHER EXCISION
 - (61) OTHER: _____

D. PHYSICAL MEASURES

- (68) APPLY TAPE/ACE WRAP, OR SLING
 - (69) APPLY SPLINT
 - (70) REDUCE FRACTURE
 - (71) APPLY PLASTER CAST
 - (72) REMOVE PLASTER CAST
 - (73) ORDER PHYSICAL THERAPY
 - (74) ORDER INHALATION THERAPY
 - (75) ORDER IMMUNIZATIONS & VACCINATIONS
 - (76) ADMINISTER IMMUNIZATIONS & VACCINATIONS
 - (77) OTHER:

A grid of 40 empty square boxes arranged in 5 columns and 8 rows. The boxes are outlined in black and are evenly spaced both horizontally and vertically.

c. OTHER

- (72) ROUTINE DISEASE COUNSELING
 - (73) SPECIAL DISEASE COUNSELING
 - (74) CONTRACEPTIVE ADVICE OR PROCEDURE
 - (75) GENERAL PSYCHOLOGICAL COUNSELING
 - (76) NEW PRESCRIPTION
 - (77) REFILL PRESCRIPTION
 - (78) CHAPERONING
 - (79) ADMINISTRATIVE ACTION
 - 800 OTHER.

A grid of 30 empty square boxes arranged in 5 rows and 6 columns. The boxes are outlined in black and are evenly spaced both horizontally and vertically.

33 SPECIALIZED CLINIC PROCEDURES PERFORMED

CARD 2

PROCEDURE NUMBER

Appendix B

PREVIOUS RESEARCH INTO PHYSICIAN EXTENDERS' QUALITY OF CARE

Since the inception of formal physician extender training programs, the question of the quality of care level rendered by physician extenders has not been slighted. However, if one looks specifically at the technical process of care rendered by physician extenders of various types to their patients, the data are quite limited. In fact, only one study of the technical process of care in which encounter forms were used as the method of data collection has been reported (Kane, Olsen, Castle, 1976).

In their sweeping evaluation of physician extender (PE) programs, Appel and Lowin (1975) reported that "the evidence on quality of care is extensive and universally favorable to the PE. The recent findings can be summarized as follows:

- (1) When patients are seen by PEs and later by physicians, the diagnosis and treatment is almost always in substantial agreement.
- (2) Over time, health among those receiving care from PEs is comparable to or better than that of those receiving conventionally delivered services.
- (3) Physicians associated with PEs almost always report that the quality of care provided by PEs is either better or at least comparable.
- (4) Studies show that PE adherence to established protocol is as good as or better than that of physicians.
- (5) PEs refer patients to the supervising physicians when necessary, and tend to err in the direction of referring too many rather than missing those who need to be seen by the MD.
- (6) Public acceptance of PE services is almost universally favorable, and many feel that the quality is superior.
- (7) Patient management by physicians and PEs has been judged to be roughly equal by third party physician review.

Before turning to findings specifically concerned with measurement of outcome or process of care, it is worth noting a study in which a rating of job performance for physician assistants was obtained from a rating scale completed by their supervising physicians. "Seventy-six percent of the 662 supervising physicians surveyed were 'greatly satisfied' with their physician's assistants and another 19 percent were 'moderately satisfied.' Only 5 percent expressed lesser degrees of satisfaction. Similarly, 77 percent of these supervising physicians stated that they would 'definitely' rehire the same physician's assistant if they had it to do over again and another 16 percent 'probably' would. Only 7 percent indicated that they would not hire the same physician's assistant." Of interest is the fact that "graduating from a military-sponsored physician's assistant program appears to have a beneficial effect upon performance." The author could not distinguish between the possibilities that the training program provided by the military is superior, or that military physician assistants are rated more favorably because they have been given greater responsibility and thus find themselves in "more challenging and demanding clinical situations" (Perry, 1977).

Many findings covering PE quality are not directed toward technical process of care provided. For example, the outcome of care delivered by physician extenders has been studied in a number of settings. In 1969, Lewis et al. compared regular clinics staffed by physicians with nurse practitioner clinics which treated comparable patient populations. There were no differences in terms of deaths or severity of disease between the two patient groups, but there were some statistically significant differences in outcomes: patients in the nurse clinics reported relatively decreased disability as well as decreased discomfort as reflected by frequency of complaints. In addition, patients in the nurse clinics had statistically significantly fewer broken appointments, while patients in regular clinics were significantly more critical of clinic care and reported significantly higher rates of use of "other" care resources. Lewis et al. pointed out that these clinics were ministering primarily to chronically ill patients, where the supporting-role functions of nurse practitioners

might well be highly consistent with the majority of needs of the patients. Sackett et al. (1974), in a private office setting, were able to show similar levels of physical, emotional, and social functioning in two comparable groups of patients who had received either nurse practitioner or conventional (physician) care for one full year. Levine et al. (1976) compared the outcomes of medical care for patients seen by ten physicians and twelve health associates delivering ambulatory care in a prepaid group practice. Focusing on more acute problems, they examined such outcomes as frequency and intensity of pain or discomfort, level of anxiety, and degree of activity limitation, as well as patient satisfaction. Their analysis suggested that the health associates were "providing care, within their areas of responsibility, of comparable quality to that delivered by physicians." Regarding process of care, Levine et al. compared the general types of care (e.g., acute care, chronic care, well care), rendered by physicians and health associates, but they did not then present any data concerning the quality of the technical process of care rendered.

Turning to technical process of care, the data are distinctly more limited. Komaroff (1974), and more recently Sullivan (1976), showed that PEs adhere to established protocols which are designed to define appropriate, high quality diagnosis and management of problems. Sullivan reports that the introduction of check-list protocols for sore throats raised (for both physicians and physician extenders) questioning for presence of drug allergies from 7 percent before protocol use to 97 percent after protocol use; raised performance of throat culture from 83 percent to 90 percent; and, also appropriately, lowered the giving of antibiotics from 45 percent before using the protocol to 16 percent after the protocol. Fine and Silver (1973) assessed the comparative diagnostic abilities of child health associate interns and practicing pediatricians as both types of providers evaluated 143 ambulatory pediatric patients. Diagnostic agreements by the two groups occurred in 91.6 percent of cases; in 4.9 percent (seven patients) the child health associate intern listed diagnoses not recorded by the pediatrician; in 3.5 percent (five patients), differences occurred in their diagnostic

interpretation. The authors concluded that the accuracy with which child health associate interns can identify common pediatric problems is comparable to that of pediatricians.

In the realm of management, LoGerfo et al. (1976), in comparing the quality of ambulatory care provided by a prepaid group organization with that provided by the fee-for-service sector, included the new health practitioners (nurse practitioners and Medex) employed by the prepaid group in their calculations and evaluation. However, the care rendered by the prepaid group was provided by generalist and specialist physicians as well as by new health practitioners, and the new health practitioners' performance was not separately reported, so it is not possible to reach any conclusion about the quality of technical care provided by the new health practitioners considered independently. In general, however, there was no significant difference between care provided in the prepaid group and that provided in the fee-for-service setting. When trends did exist, they consistently favored the prepaid group practice, which, as stated, did include a number of new health practitioners.

A recent study compared the management of patients with acute respiratory illnesses by Medex from a health maintenance organization, and internists and Amosists (military corpsmen who receive brief medical training and are taught to use a number of explicit clinical algorithms) from a major military base. Concentrating on only certain aspects of this extensive study, we note that, in comparison to the physicians, Medex ordered a variety of diagnostic tests as appropriately as physicians, and their use of antibiotics was sometimes as appropriate and sometimes clearly more appropriate than that of physicians. (Tompkins et al., 1977)

As part of an experiment utilizing nurse practitioners in office settings, Sibley et al. (1975) measured and specifically compared the quality of clinical care provided by physicians and nurse practitioners. Appraisal was carried out by abstraction of data from charts. Explicit criteria for proper management of selected "indicator" conditions (e.g., otitis media, hypertension, prenatal care, depression, urinary tract infection, knee injury) and for

appropriate use of drugs (e.g., chloramphenicol, steroids, tetracycline, vitamin B₁₂, tranquilizers, cardiac glycosides) were then applied. The investigators were able to show that none of the observed physician/nurse-practitioner differences in adequacy of care was significant at the 5 percent level. Further support for the adequacy of nurse practitioner care came from an analysis "to assess the likelihood that the adequacy of care could, in fact, be worse in the [nurse practitioner] practice. The analysis showed that the probability of a true deterioration of 10 percent or more in the quality of care in the [nurse practitioner] practice compared with the [control] practice was [only] 0.018 for indicator conditions and 0.072 for drugs."

Evaluation of physician's assistants by means of direct observation of technical process of care was carried out by Duttera and Harlan (1978) at ten rural primary care practice sites. When physician's assistants (both physician associates and Medex) were compared to their physician employers for appropriateness of diagnosis and therapy, Duttera and Harlan found that the two groups of providers "handled less severe and more severe encounters equally well, with no statistically significant difference in performance." (Also of interest, though of less pertinence to this review, is that "scores of physician assistants were correlated with those of their physician employers ($r = .61$, $P < .01$.)"

An innovative approach to the question of technical competence of nurse practitioners was carried out by Perrin and Goodman (1978) in their study of management over the telephone of five common acute pediatric problems, by pediatricians in practice, pediatric house officers, and pediatric nurse practitioners. The providers were scored for technical and non-technical aspects of care, including relevance and completeness of historical information gathered, and correctness of disposition suggested, as well as telephone-interviewing skill. The pediatric nurse practitioners scored significantly higher in all aspects of telephone management. They were also no less efficient than the pediatricians and pediatric house officers; that is, they "gathered historical data and suggested therapy with no more unnecessary questioning or discussion than physicians."

There has been one published study (Kane, Olsen, Castle, 1976) in which the technical process of care of physician extenders, specifically Medex, was compared with the technical process of care provided by their physician preceptors, through the use of an encounter form (patient contact record). When criteria were established for the correct use of laboratory tests and appropriateness of treatments ordered, there was no significant difference noted in six of the ten process measures used, between the care rendered by Medex and their supervising physicians. In three of the process measures, the difference between the physician and Medex was significant at $0.05 < P < .10$, with the trend favoring higher quality by Medex; and for one process measure, the difference between physician and Medex was significant at $P < .05$, indicating significantly higher quality provided by Medex (see Table 12). Kane, Olsen and Castle therefore concluded that "the Medex is more likely to use appropriate laboratory tests and less likely to use inappropriate treatments." Although their conclusion might appear somewhat strong, these data do indicate that Medex provided a technical process of care, in these rural Utah practices, of at least as high a quality as that provided by their physician preceptors. Kane, Olsen and Castle's study also demonstrated the feasibility of using encounter forms to collect data to examine the quality of care. As we have done, they also cautioned: "The data are presented only as indicators of patterns of care and, as such, should be interpreted cautiously. Our data represent what was checked off by the physicians and Medex on the preprinted patient encounter forms; no means to verify the accuracy of diagnosis or reporting was possible."

In summary, the quality of care rendered by physician extenders has indeed attracted attention but relatively little study has been carried out concerning the technical process of care rendered by physician extenders. The available information suggests that, for the health problems they manage, in diagnostic capability, laboratory ordering, and treatment decisions, physician extenders render a quality of care equivalent to that of their supervising physicians.

Table 12

Process Measures of Quality of Care: Use of Laboratory Tests^a

Diagnosis	Test	Test Ordered, No. (%) ^b		
		Physician	Medex	Both
Fever of unknown origin	WBC count	1/13 (8)	2/11 (18)	0/1 (0)
Diabetes mellitus	Urinalysis or blood chemistry	128/164 (78)	15/17 (88)	21/33 (64)
Septic sore throat and pharyngitis	Bacterial culture ^c	285/490 (58)	119/176 (68)	42/63 (67)
Pneumonia	Bacterial culture or x-ray film ^d	31/61 (51)	19/26 (73)	0/5 (0)
Dysfunctional uterine bleeding	Hematocrit or hemoglobin	15/35 (43)	5/8 (63)	1/1 (100)
Prenatal care	Hematocrit or hemoglobin	464/1020 (45)	43/114 (43)	10/28 (36)

^aSeven Medex I and II practices.

^bShown as number of patients for whom a specified test was ordered/number of patients with indicated diagnosis.

^cDifference between physician and Medex significant: $P < .05$.

^dDifference between physician and Medex significant: $0.05 < P < .10$.

Process Measures of Quality of Care: Treatments Ordered^a

Diagnosis	Indicated Treatment	Treatment Prescribed, No. (%) ^b		
		Physician	Medex	Both
Exogenous obesity	Counseling ^c	48/236 (20)	13/39 (33)	8/34 (23)
Fever of unknown origin	Antibiotics not given	13/20 (65)	117/133 (88)	1/1 (100)
Contact dermatitis or asthma	Systemic steroids not given	903/1290 (70)	117/133 (88)	58/64 (91)
Upper respiratory tract infection	Antibiotics not given ^c	903/1290 (70)	334/448 (75)	38/50 (76)

^aSeven Medex I and II practices.

^bShown as number of patients for whom indicated treatment was prescribed/number of patients with indicated diagnosis.

^cDifference between physician and Medex significant: $0.05 < P < .10$.

SOURCE: Kane RL, Olsen DM, Castle CH: Medex and their physician preceptors. JAMA 236:2509-2512, 1976

APPENDIX B REFERENCES

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APPENDIX C

ECG Group

Thyroid disease
Diabetes mellitus
Ischemic heart diseases
Arrhythmias or heart block
Other heart diseases
Hypertension
Syncope
Cholecystitis
Heart murmur

X-ray Group

Asthma
Tension headache
Migraine headache
Ischemic heart diseases
Arrhythmias or heartblock
Other heart diseases
Acute sinusitis
Pneumonia, pneumonitis
Acute bronchitis
Chronic bronchitis, emphysema, COPD
Chronic sinusitis
Cholecystitis
Osteoarthritis
Rheumatoid arthritis
Other arthritis/rheumatism
Bursitis, tenosynovitis, synovitis
Backache with sciatica
Backache alone
Pain in joint
Other headache
Fracture of lower limb
Fracture of upper limb
Dislocation, upper extremity
Other fracture
Sprain/strain upper limb
Sprain/strain lower limb
Sprain/strain neck/back
Heart murmur
Dislocation, lower extremity
Trauma to head
Muscle pain
Other bones, joints, muscles

Physical Therapy Group

Osteoarthritis
Rheumatoid arthritis
Other arthritis/rheumatism
Bursitis, tenosynovitis, synovitis
Backache with sciatica
Backache alone
Pain in joint
Fracture of lower limb
Fracture of upper limb
Dislocation, upper extremity
Other fracture
Sprain/strain upper limb
Sprain/strain lower limb
Sprain/strain neck/back
Dislocation, lower extremity
Other bones, joints, muscles